

PERSONAL CLEANSING COMPOSITION CONTAINING
IRREGULARLY SHAPED PARTICLES AND SPHERICAL PARTICLES

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CROSS REFERENCE TO RELATED APPLICATION

The application claims the benefit of US Provisional application Serial No. 60/442,757 (Case 9150P), filed on January 27, 2003.

FIELD

The present invention relates to personal cleansing compositions containing particles. More specifically, it relates to personal cleansing compositions containing a mixture of irregularly shaped particles and spherically shaped particles. The compositions are intended to deliver benefits of irregularly shaped particles, particularly hair volume and fullness, with benefits derived from the spherically shaped particles such as improved conditioning and combing.

BACKGROUND

Solid particles are known for use as benefit agents in a variety of formulations and personal care compositions. Solid particles can impart benefits both to the compositions comprising them or surfaces to which the compositions are applied. For examples, solid particles can be used as pigments or coloring agents, opacifiers, pearlescent agents, feel modifiers, oil absorbers, skin protectants, matting agents, friction enhancers, slip agents, conditioning agents, exfoliants, odor absorbers, or cleaning enhancers. Additionally, many active ingredients useful as treatment agents for various disorders or socially embarrassing conditions are available and typically used in solid particulate form including antiperspirant agents, anti-dandruff agents, antimicrobials, antibiotics, and sunscreens.

Typically when it is desired to modify the properties of a surface through application of particles, the particles are applied via leave-on preparations that are rubbed, sprayed, or otherwise applied directly onto the surface to be affected. Typical personal care preparations suitable for delivery of solid particles to hair or skin surfaces include moisturizers, lotions, creams, loose or pressed powders, sticks, tonics, gels, and various sprays such as aerosol or pump sprays. These products are typically applied directly to the surface whereupon particles are deposited and retained by the composition itself or by residual non-volatile elements of the composition after evaporation and drying.

It has also been known to formulate solid particle benefit agents into rinse-off or cleansing compositions such as hair rinses, shampoos, liquid and bar soaps, conditioners, or colorants. Frequently, the solid particle benefit agent is used to affect the overall appearance, stability or aesthetics of the composition itself. For example, it is known to add colorant particles, pigments, or pearlescent agents to compositions to improve the acceptability and attractiveness of the product to potential consumers. It is also known to add particulate benefit agents to affect the in use performance, appearance or aesthetic properties of the composition or to provide a tactile signal to the user. For example, exfoliant particles are frequently used in cleansing compositions to improve abrasion and removal of oils and dirt from washed surfaces and to impart a perceptible “scrubbing” sensation to the user. Typically such solid particle agents are not intended or desired to be deposited onto the substrate and are removed during dilution and rinsing of the composition from the surface to which they are applied.

It has also been known to formulate solid particles into rinse-off or cleansing compositions to improve the volume, body, or fullness of the hair through increased interactions between hair fibers. When deposition of solid particle benefit agents from washing compositions is intended, the compositions available heretofore have suffered from the drawbacks of inefficient deposition, requiring the use of excess amounts of the particle agent or ineffective benefit delivery. Further, compositions containing solid particles intended to provide increased interaction between hair fibers frequently result in negative conditioning, wet detangling, and wet combing performance due to the frictional impact of the particles. Prior attempts to mitigate the negative conditioning attributes of particle containing compositions have either been insufficient or have negatively impacted the deposition or benefit associated with the particle.

Therefore, a need still exists for a rinse-off cleansing composition, capable of containing and effectively depositing and retaining solid particle benefit agents on the treated surface to deliver improved hair volume, body, and fullness while simultaneously delivering improved wet conditioning and combing performance.

SUMMARY

It has now been discovered that combinations of irregularly shaped particles and spherically shaped particles can deliver improved hair volume, body and fullness with improved wet conditioning and combing performance. The present invention is directed to a personal cleansing composition comprising:

- a) from about 5 to about 50 weight percent of a deterative surfactant,
- b) from at least about 0.1 weight percent of irregularly shaped particles having a particle size of at least 0.01 micron,

c) from at least about 0.1 weight percent of spherical particles having a particle size of at least 0.01 micron,

d) from at least about 20 weight percent of an aqueous carrier,

wherein the median particle size of the spherical particle is greater than the median particle size of the irregularly shaped particle.

Alternatively, the present invention is directed to a personal cleansing composition wherein the weight ratio of the spherically shaped particles to the irregularly shaped particles is at least about 1:1, or personal cleansing compositions wherein after treatment with the personal cleansing composition, the hair demonstrates a friction coefficient of from about 1 to about 2.

The present invention is further directed to a method of using the personal cleansing composition.

These and other features, aspects, and advantages of the present invention will become evident to those skilled in the art from a reading of the present disclosure.

DETAILED DESCRIPTION

While the specification concludes with claims that particularly point out and distinctly claim the invention, it is believed the present invention will be better understood from the following description.

The personal cleansing compositions of the present invention include detergent surfactant, non-platelet particles, a deposition aid and an aqueous carrier. Each of these essential components, as well as preferred or optional components, are described in detail hereinafter.

All percentages, parts and ratios are based upon the total weight of the compositions of the present invention, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and, therefore, do not include solvents or by-products that may be included in commercially available materials, unless otherwise specified.

All molecular weights as used herein are weight average molecular weights expressed as grams/mole, unless otherwise specified.

Herein, "comprising" means that other steps and other ingredients which do not affect the end result can be added. This term encompasses the terms "consisting of" and "consisting essentially of". The compositions and methods/processes of the present invention can comprise, consist of, and consist essentially of the essential elements and limitations of the invention described herein, as well as any of the additional or optional ingredients, components, steps, or limitations described herein.

The term "fluid" as used herein, means a liquid or a gas which tends to take the shape of its container, container being the wall of the flexible hollow particles.

The term "hollow" as used herein, means a particle having an encapsulated area that is substantially free of solid mass, the encapsulated area comprising from 10 to 99.8 percent of the total volume of the particle.

5 The term "non-platelet" as used herein, means a particle having a spherical, an oval, an irregular, or any other shape in which the ratio of the largest dimension to the smallest dimension (defined as the aspect ratio) is less than 10.

The term "irregular" as used herein, means a non-spherical and non-platelet particle having an aspherical, oval, elliptical, or other non-uniform shape and/or a non-uniform surface texture.

10 The term "permeable" as used herein, means that a substance that permits a liquid or gas to pass through it under given conditions.

The term "polymer" as used herein shall include materials whether made by polymerization of one type of monomer or made by two (*i.e.*, copolymers) or more types of monomers.

15 The term "spherical" as used herein, means a spherical body which is the set of points in a metric space whose distance from a fixed point is approximately constant. Here, the meaning of "approximately" is that the fixed points are within a distance of $\pm 15\%$.

20 The term "water soluble" as used herein, means that the polymer is soluble in water in the present composition. In general, the polymer should be soluble at 25° C at a concentration of 0.1% by weight of the water solvent, preferably at 1%, more preferably at 5%, most preferably at 15%.

All cited references are incorporated herein by reference in their entireties. Citation of any reference is not an admission regarding any determination as to its availability as prior art to the claimed invention.

25 A. Deterative Surfactant

The composition of the present invention includes a deterative surfactant. The deterative surfactant component is included to provide cleaning performance to the composition. The deterative surfactant component in turn comprises anionic deterative surfactant, zwitterionic or amphoteric deterative surfactant, or a combination thereof. Such surfactants should be physically
30 and chemically compatible with the essential components described herein, or should not otherwise unduly impair product stability, aesthetics or performance.

Suitable anionic deterative surfactant components for use in the composition herein include those which are known for use in hair care or other personal care cleansing compositions. The concentration of the anionic surfactant component in the composition should be sufficient to
35 provide the desired cleaning and lather performance, and generally range from about 5% to about

50%, preferably from about 8% to about 30%, more preferably from about 10% to about 25%, even more preferably from about 12% to about 22%.

Preferred anionic surfactants suitable for use in the compositions are the alkyl and alkyl ether sulfates. These materials have the respective formulae ROSO_3M and $\text{RO}(\text{C}_2\text{H}_4\text{O})_x\text{SO}_3\text{M}$,
5 wherein R is alkyl or alkenyl of from about 8 to about 18 carbon atoms, x is an integer having a value of from 1 to 10, and M is a cation such as ammonium, alkanolamines, such as triethanolamine, monovalent metals, such as sodium and potassium, and polyvalent metal cations, such as magnesium, and calcium.

Preferably, R has from about 8 to about 18 carbon atoms, more preferably from about 10
10 to about 16 carbon atoms, even more preferably from about 12 to about 14 carbon atoms, in both the alkyl and alkyl ether sulfates. The alkyl ether sulfates are typically made as condensation products of ethylene oxide and monohydric alcohols having from about 8 to about 24 carbon atoms. The alcohols can be synthetic or they can be derived from fats, e.g., coconut oil, palm kernel oil, tallow. Lauryl alcohol and straight chain alcohols derived from coconut oil or palm
15 kernel oil are preferred. Such alcohols are reacted with from about 0 and about 10, preferably from about 2 to about 5, more preferably about 3, molar proportions of ethylene oxide, and the resulting mixture of molecular species having, for example, an average of 3 moles of ethylene oxide per mole of alcohol, is sulfated and neutralized.

Other suitable anionic deterative surfactants are the water-soluble salts of organic, sulfuric
20 acid reaction products conforming to the formula $[\text{R}^1\text{-SO}_3\text{-M}]$ where R^1 is a straight or branched chain, saturated, aliphatic hydrocarbon radical having from about 8 to about 24, preferably from about 10 to about 18, carbon atoms; and M is a cation described hereinbefore.

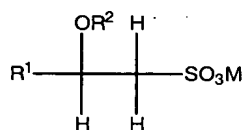
Still other suitable anionic deterative surfactants are the reaction products of fatty acids esterified with isethionic acid and neutralized with sodium hydroxide where, for example, the
25 fatty acids are derived from coconut oil or palm kernel oil; sodium or potassium salts of fatty acid amides of methyl tauride in which the fatty acids, for example, are derived from coconut oil or palm kernel oil. Other similar anionic surfactants are described in U.S. Pat. Nos. 2,486,921; 2,486,922; and 2,396,278.

Other anionic deterative surfactants suitable for use in the compositions are the
30 succinates, examples of which include disodium N-octadecylsulfosuccinate; disodium lauryl sulfosuccinate; diammonium lauryl sulfosuccinate; tetrasodium N-(1,2-dicarboxyethyl)-N-octadecylsulfosuccinate; diamyl ester of sodium sulfosuccinic acid; dihexyl ester of sodium sulfosuccinic acid; and dioctyl esters of sodium sulfosuccinic acid.

Other suitable anionic deterative surfactants include olefin sulfonates having from about

10 to about 24 carbon atoms. In addition to the true alkene sulfonates and a proportion of hydroxy-alkanesulfonates, the olefin sulfonates can contain minor amounts of other materials, such as alkene disulfonates depending upon the reaction conditions, proportion of reactants, the nature of the starting olefins and impurities in the olefin stock and side reactions during the sulfonation process. A non-limiting example of such an alpha-olefin sulfonate mixture is described in U.S. Patent 3,332,880.

Another class of anionic deterative surfactants suitable for use in the compositions is the beta-alkyloxy alkane sulfonates. These surfactants conform to the Formula (I):



where R^1 is a straight chain alkyl group having from about 6 to about 20 carbon atoms, R^2 is a lower alkyl group having from about 1 to about 3 carbon atoms, preferably 1 carbon atom, and M is a water-soluble cation as described hereinbefore.

Preferred anionic deterative surfactants for use in the compositions include ammonium lauryl sulfate, ammonium laureth sulfate, triethylamine lauryl sulfate, triethylamine laureth sulfate, triethanolamine lauryl sulfate, triethanolamine laureth sulfate, monoethanolamine lauryl sulfate, monoethanolamine laureth sulfate, diethanolamine lauryl sulfate, diethanolamine laureth sulfate, lauric monoglyceride sodium sulfate, sodium lauryl sulfate, sodium laureth sulfate, potassium lauryl sulfate, potassium laureth sulfate, sodium lauryl sarcosinate, sodium lauroyl sarcosinate, lauryl sarcosine, cocoyl sarcosine, ammonium cocoyl sulfate, ammonium lauroyl sulfate, sodium cocoyl sulfate, sodium lauroyl sulfate, potassium cocoyl sulfate, potassium lauryl sulfate, triethanolamine lauryl sulfate, triethanolamine lauryl sulfate, monoethanolamine cocoyl sulfate, monoethanolamine lauryl sulfate, sodium tridecyl benzene sulfonate, sodium dodecyl benzene sulfonate, sodium cocoyl isethionate and combinations thereof.

Suitable amphoteric or zwitterionic deterative surfactants for use in the composition herein include those which are known for use in hair care or other personal cleansing compositions. Concentration of such amphoteric deterative surfactants preferably ranges from about 0.5% to about 20%, preferably from about 1% to about 10%. Non-limiting examples of suitable zwitterionic or amphoteric surfactants are described in U.S. Pat. Nos. 5,104,646 (Bolich Jr. et al.), 5,106,609 (Bolich Jr. et al.).

Amphoteric deterative surfactants suitable for use in the composition are well known in the art, and include those surfactants broadly described as derivatives of aliphatic secondary and tertiary amines in which the aliphatic radical can be straight or branched chain and wherein one of

the aliphatic substituents contains from about 8 to about 18 carbon atoms and one contains an anionic group such as carboxy, sulfonate, sulfate, phosphate, or phosphonate. Preferred amphoteric deterative surfactants for use in the present invention include cocoamphoacetate, cocoamphodiaceate, lauroamphoacetate, lauroamphodiaceate, and mixtures thereof.

5 Zwitterionic deterative surfactants suitable for use in the composition are well known in the art, and include those surfactants broadly described as derivatives of aliphatic quaternary ammonium, phosphonium, and sulfonium compounds, in which the aliphatic radicals can be straight or branched chain, and wherein one of the aliphatic substituents contains from about 8 to about 18 carbon atoms and one contains an anionic group such as carboxy, sulfonate, sulfate,
10 phosphate or phosphonate. Zwitterionics such as betaines are preferred.

 The compositions of the present invention may further comprise additional surfactants for use in combination with the anionic deterative surfactant component described hereinbefore. Suitable optional surfactants include nonionic and cationic surfactants. Any such surfactant known in the art for use in hair or personal care products may be used, provided that the optional
15 additional surfactant is also chemically and physically compatible with the essential components of the composition, or does not otherwise unduly impair product performance, aesthetics or stability. The concentration of the optional additional surfactants in the composition may vary with the cleansing or lather performance desired, the optional surfactant selected, the desired product concentration, the presence of other components in the composition, and other factors
20 well known in the art.

 Non limiting examples of other anionic, zwitterionic, amphoteric or optional additional surfactants suitable for use in the compositions are described in McCutcheon's, Emulsifiers and Detergents, 1989 Annual, published by M. C. Publishing Co., and U.S. Pat. Nos. 3,929,678, 2,658,072; 2,438,091; 2,528,378.

25 **B. Particles**

 The composition of the present invention includes particles. The particles may be irregularly shaped particles, spherical particles, or platelet particles. In one embodiment of the present invention, the composition contains a mixture of at least one spherical particle with at least one irregular particle wherein the median particle size of the spherical particle is greater than the
30 median particle size of the irregular particle. In another embodiment of the present invention, the weight ratio of spherical particles to irregularly shaped particles in the composition is at least about 1:1, preferably at least about 1.5:1, still more preferably at least about 2:1, and still more preferably at least about 2.5:1. In another embodiment of the present invention, the composition contains at least one spherical particle in combination with at least one other particle wherein after
35 treatment with the personal cleansing composition, the hair demonstrates a friction coefficient of

from about 1 to about 2, preferably the hair will demonstrate a friction coefficient of from about 1.05 to about 1.8, still more preferably, the hair will demonstrate a friction coefficient of from about 1.1 to about 1.7, and even more preferably, the hair will demonstrate a friction coefficient of from about 1.2 to about 1.6

5 **1. Irregularly Shaped Particles**

The composition of the present invention includes an irregularly shaped particle. Irregularly shaped particles are particles which lack a uniform spherical or platelet shape. Irregularly shaped particles are typically obtained through precipitation, grinding or pulverizing, or are comprised of fused or aggregated primary particles to yield particles with irregular shape
10 or surface texture. The irregularly shaped particles of the present invention preferably have a particle size of less than 100 μm . Typically, the particles will have a particle size from about 0.01 μm to about 80 μm , still more preferably from about 0.1 μm to about 70 μm , and even more preferably from about 0.5 μm to about 60 μm in diameter, and even more preferably from about 1 μm to about 40 μm in diameter.

15 In the compositions of the present invention, it is preferable to incorporate at least 0.05% by weight of irregularly shaped particles, more preferably at least 0.1%, still more preferably at least 0.2%, and even more preferably at least 0.5% by weight of particles. In the compositions of the present invention, it is preferable to incorporate no more than about 20% by weight of particles, more preferably no more than about 10%, still more preferably no more than 5%, and
20 even more preferably no more than 2% by weight of irregularly shaped particles.

The irregular particle and use levels are selected for the particular purpose of the composition. For example, where it is desired to deliver color benefits, pigment particles conferring the desired hues can be incorporated. Where hair volume or style retention benefits are desired, particles capable of conferring friction can be used to reduce disruption and collapse
25 of the hair style. Determination of the levels and particle types is within the skill of the artisan. Particles that are generally recognized as safe, and are listed in C.T.F.A. Cosmetic Ingredient Handbook, Sixth Ed., Cosmetic and Fragrance Assn., Inc., Washington D.C. (1995), incorporated herein by reference, can be used.

The particle may be colored or non-colored (for example, white). Suitable irregularly
30 shaped particles include for example fumed silica, polymethylmethacrylate, micronized teflon, boron nitride, barium sulfate, acrylate polymers, aluminum silicate, aluminum starch octenylsuccinate, calcium silicate, cellulose, chalk, corn starch, diatomaceous earth, fuller's earth, glyceryl starch, hydrated silica, magnesium carbonate, magnesium hydroxide, magnesium oxide, magnesium trisilicate, maltodextrin, microcrystalline cellulose, rice starch, silica, titanium
35 dioxide, zinc laurate, zinc myristate, zinc neodecanoate, zinc rosinate, zinc stearate, polyethylene,

alumina, attapulgite, calcium carbonate, calcium silicate, dextran, nylon, silica silylate, silk powder, soy flour, tin oxide, titanium hydroxide, trimagnesium phosphate, walnut shell powder, or mixtures thereof. The above mentioned powders may be surface treated with lecithin, amino acids, mineral oil, silicone oil, or various other agents either alone or in combination, which coat the powder surface and render the particles hydrophobic in nature.

The irregularly shaped particle component may also comprise various organic and inorganic pigments. The organic pigments are generally various aromatic types including azo, indigoid, triphenylmethane, anthraquinone, and xanthine dyes which are designated as D&C and FD&C blues, browns, greens, oranges, reds, yellows, etc. Organic pigments generally consist of insoluble metallic salts of certified color additives, referred to as the Lakes. Inorganic pigments include iron oxides, ultramarine and chromium or chromium hydroxide colors, and mixtures thereof.

Water insoluble irregularly shaped particles of various shapes and densities are useful. Preferred irregularly shaped particles tend to have an oval, an ellipsoid, or any other shape in which the ratio of the largest dimension to the smallest dimension (defined as the aspect ratio) is less than 10. More preferably, the aspect ratio of the particles is less than 8. Still more preferably, the aspect ratio of the particles is less than 5.

Particles useful in the present invention can be inorganic, synthetic, or semi-synthetic in composition. Hybrid particles are also useful. Synthetic particles can be made of either cross-linked or non cross-linked polymers. The particles of the present invention can have surface charges or their surface can be modified with organic or inorganic materials such as surfactants, polymers, and inorganic materials. Particle complexes are also useful.

Examples of useful inorganic particles include various silica particles including colloidal silicas, fumed silicas, precipitated silicas and silica gels. Non-limiting examples of colloidal silicas include Snowtex C, Snowtex O, Snowtex 50, Snowtex OL, Snowtex ZL available from Nissan Chemical America Corporation and colloidal silicas sold under the tradename Ludox available from W.R. Grace & Co. Non-limiting examples of fumed silicas include hydrophillic and hydrophobic forms available as Aerosil 130, Aerosil 200, Aerosil 300, Aerosil R972 and Aerosil R812 available from Degussa Corp. and those available from Cabot Corp. under the trade name Cab-O-Sil including Cab-O-Sil M-5, HS-5, TS-530, TS-610, and TS-720. Non-limiting examples of precipitated silicas include those available in both hydrophillic and hydrophobic versions from Degussa Corp. under the trade name Sipernat including Sipernat 350, 360, 22LS, 22S, 320, 50S, D10, D11, D17, and C630; those sold by W. R. Grace & Co. under the trade name Syloid, those sold by the J.M. Huber Corp. under the tradename Zeothix and Zeodent, and those available from Rhodia under the trade name Tixosil. Other non-limiting examples of useful

inorganic particles include various metallic oxides including titanium dioxide such as P25 available from Degussa , Tronox CR-840 available from Kerr McGee Chemical Corp, and MT-500B and MT-100T available from Tayca Corp. and aluminum oxide such as Aluminum Oxide C available from Degussa Corp and AC720, AC 712, and AC740 from AluChem Inc. Other useful inorganic particles include silicate glass particles such as Glamur Glo Glass Chips available from Nippon Paint Corp.

Examples of useful organic irregularly shaped particles include synthetic resin particles with irregular surface textures and non-spherical shape. Non-limiting examples include silicone resin particles available as Tospearl 240 and SR1000 available from GE Silicones.

Preferred particles will also have physical properties that are not significantly affected by typical processing of the composition. Preferably, particles having melting points greater than about 70°C are used. Still more preferably, particles having a melting point greater than 80°C are used and most preferably particles having melting point of greater than about 95°C are used. As used herein, melting point would refer to the temperature at which the particle transitions to a liquid or fluid state or undergoes significant deformation or physical property changes. In addition, many of the particles of present invention are cross-linked or have a cross-linked surface membrane. These particles do not exhibit a distinct melting point. Cross-linked particles are also useful as long as they are stable under the processing and storage conditions used in the making of the present compositions. Preferably, the particles are not drug actives. More preferably, the particles are not anti-dandruff actives.

Preferred irregularly shaped particles include hydrophillic and hydrophobically modified precipitated silicas and aluminas. Particularly preferred irregularly shaped particles include hydrophillic and hydrophobically modified precipitated silicas.

2. Spherical Particles

The compositions of the present invention include a spherical particle. Spherical particles have or substantially have the shape of a sphere and may be hollow or solid. The spherical shape can be evaluated through optical or electron microscope evaluation. The spherical particles of the present invention preferably have a particle size of less than 100 µm. Typically, the particles will have a particle size from about 0.01 µm to about 80 µm, still more preferably from about 0.1 µm to about 70 µm, and even more preferably from about 0.5 µm to about 60 µm in diameter, and even more preferably from about 1 µm to about 40 µm in diameter. Suitable spherical particles include organic and inorganic microspheres or combinations thereof.

In the compositions of the present invention, it is preferable to incorporate at least 0.05% by weight of spherical particles, more preferably at least 0.1%, still more preferably at least 0.2%, and even more preferably at least 0.5% by weight of spherical particles. In the compositions of

the present invention, it is preferable to incorporate no more than about 20% by weight of particles, more preferably no more than about 10%, still more preferably no more than 5%, and even more preferably no more than 2% by weight of particles.

Examples of synthetic spherical particles include nylon, silicone resins, poly(meth)acrylates, polyethylene, polyester, polypropylene, polystyrene, polytetrafluoroethylene, polyurethane, polyamide, epoxy resins, urea resins, and acrylic powders. Non limiting examples of useful particles are MP-2200, BPA-500 (polymethylmethacrylate), EA-209 (ethylene/acrylate copolymer), SP-501(nylon-12), SP-10 (nylon-12), ES-830 (polymethyl methacrylate), BPD-800, BPD-500, BPA-500 (polyurethane) and CL2080 (polyethylene) spherical particles available from Kobo Products, Inc., spherical polyethylene powders such as those available from Quantum Chemical under the trade name Microthene including MN701, MN710, MN-714, MN-722 and FN5100, those available from Shamrock Technologies, Inc. under the trade name CeraPURE, and those available from Micropowders Inc. under the tradename MicroPoly, polytetrafluoroethylene powders such as those available from Shamrock Technologies, Inc. under the tradenames FluoroPURE and HydroPURE, and silicone resins sold under the name Tospearl particles by GE Silicones including Tospearl 105, 120, 130, 145, 3120. Also useful are spherical particles available from Presperse, Inc. under the Ganzpearl tradename including GM-0600W, GM-0800S (polymethylmethacrylate), PS-8F, GS-0605, GS-0805 (crosslinked polystyrene), and GPA-700 (nylon-12).

Also useful in the present invention are spherical inorganic particles. Non limiting examples of inorganic spherical particles include spherical silica particles available in various particle sizes and porosities including MSS-500/H, MSS-500/3H, MSS-500, MSS-500/3, MSS-500/N and MSS-500/3N available from KOBO Products Inc.; those available from Presperse Inc. under the trade name Spheron including Spheron N-2000, P1000, P-1500 and L-1500, and those available from Sunjin Chemical Co. under the trade name Sunsil including Sunsil 20, 20L, 20H, 50L, 50, 50H, 130L, 130 and 130H. Other non-limiting examples of spherical inorganic particles useful in the present invention include various silicates including magnesium silicate such as those available from 3M under the trade name CM-111 Cosmetic Microspheres, and glass spheres such as those available from Nippon Paint Corp. under the trade name PrizmaLite Glass Spheres.

Also useful in the present invention are spherical hollow particles. The wall of the particles of the present invention may be formed from a thermoplastic material. The thermoplastic material may be a polymer or copolymer of at least one monomer selected from the following groups: acrylates, methacrylates, styrene, substituted styrene, unsaturated dihalides, acrylonitriles, methacrylonitrile, vinylidene chloride. The thermoplastic materials may contain amide, ester,

urethane, urea, ether, carbonate, acetal, sulfide, phosphate, phosphonate ester, and siloxane linkages.

Non-limiting examples of commercially available hollow spherical particles are 551 DE (particle size range of approximately 30-50 μm and density of approximately 42 kg/m^3), 551 DE 20 (particle size range of approximately 15-25 μm and density of approximately 60 kg/m^3), 461 DE (particle size range of approximately 20-40 μm and density 60 kg/m^3), 551 DE 80 (particle size of approximately 50-80 μm and density of approximately 42 kg/m^3), 091 DE (particle size range of approximately 35-55 μm and density of approximately 30 kg/m^3), all of which are marketed under the trademark EXPANCEL™ by Akzo Nobel. Other examples of suitable particles for use herein are marketed under the trademarks DUALITE® and MICROPEARL™ series of microspheres from Pierce & Stevens Corporation. Particularly preferred hollow particles are 091 DE and 551DE 50. The hollow particles of the present invention exist in either dry or hydrated state. The aforesaid particles are nontoxic and non irritating to the skin.

Hollow particles that are useful in the invention can be prepared, for example, via the processes described in EP-56,219, EP-348,372, EP-486,080, EP-320,473, EP-112,807 and U.S. Pat. No. 3,615,972, the full disclosure of each of which is incorporated herein by reference. Particles comprised of polymers and copolymers obtained from esters, such as, for example, vinyl acetate or lactate, or acids, such as, for example, itaconic, citraconic, maleic or fumaric acids may also be used. See, in this regard, Japanese Patent Application No. JP-A-2-112304, the full disclosure of which is incorporated herein by reference.

Alternatively, the wall of the hollow particles useful in the present invention may be formed from an inorganic material. The inorganic material may be a silica, a soda-lime-borosilicate glass, a silica-alumina ceramic, or an alkali alumino silicate ceramic. Non-limiting examples of commercially available suitable low density, inorganic particles are H50/10,000 EPX (particle size range approximately 20-60 μm), S38 (particle size range approximately 15-65 μm), W-210 (particle size range approximately 1-12 μm), W-410 (particle size range approximately 1-24 μm), W-610 (particle size range approximately 1-40 μm), G-200 (particle size range approximately 1-12 μm), G-400 (particle size range approximately 1-24 μm), G-600 (particle size range approximately 1-40 μm), all of which are marketed under the trademarks 3M™ Scotchlite™ Glass Bubbles, 3M™ Zeeospheres™ ceramic microspheres, and 3M™ Z-Light Spheres™ Ceramic Microspheres. Also useful are hollow calcium aluminum borosilicate spheres marketed as LUXSIL™ (3-13 μm mean diameter) available from PQ Corporation.

The surface of the particle may be charged through a static development or with the attachment of various ionic groups directly or linked via short, long or branched alkyl groups.

The surface charge can be anionic, cationic, zwitterionic or amphoteric in nature.

Preferred spherical particles will also have physical properties that are not significantly affected by typical processing of the composition. Preferably, particles having melting points greater than about 70°C are used. Still more preferably, particles having a melting point greater than 80°C are used and most preferably particles having melting point of greater than about 95°C are used. As used herein, melting point would refer to the temperature at which the particle transitions to a liquid or fluid state or undergoes significant deformation or physical property changes. In addition, many of the particles of present invention are cross-linked or have a cross-linked surface membrane. These particles do not exhibit a distinct melting point. Cross-linked particles are also useful as long as they are stable under the processing and storage conditions used in the making of the present compositions. Preferably, the particles are not drug actives. More preferably, the particles are not anti-dandruff actives.

Preferred spherical particles include spherical polyethylenes, silicone resins, and nylons. Particularly preferred are spherical polyethylenes.

3. Other Particles

Other particles, including platelet particles, can be used in the compositions of the present invention provided they are physically and chemically compatible with the essential components described herein, or do not otherwise unduly impair product stability, aesthetics or performance.

Platelet particles according to the invention are particles in which the ratio of the largest dimension to the smallest dimension (defined as the aspect ratio) is greater than about 10. Platelet particles are typically used in cleansing compositions to impart desired aesthetic benefits to the composition, such as color or pearlescence, and do not typically deliver the desired hair friction or volume, fullness and style benefits desired. However, it has been found that particles with an aspect ratio of greater than 10 may be useful if they remain as aggregated particle stacks in the composition.

Non-limiting examples of platelet particles include various natural and synthetic silicate materials including talc, mica, sericite, titanated micas, magnesium aluminum silicates, aluminum silicate, calcium silicate, clays, bentonite, hectorite, montmorillonite. Other non-limiting examples of platelet materials include bismuth oxychloride, boron nitride, and platelet titanium dioxides. Platelet particles of the present invention can have surface charges or their surface can be modified with organic or inorganic materials such as surfactants, polymers, and inorganic materials. Non-limiting examples of commercially available platelet particles include Laponite XLS, Laponite SCPX-2549, Claytone SO and Gelwhite H NF from Southern Clay Products Inc.; Bentone 38, Bentone 27, and Bentone 34 available from Rheox, Inc.; Flamenco Ultra Silk 2500,

Flamenco Satin Pearl 3500 and Timica Silkwhite 110W from Engelhard Corp; magnesium aluminum silicates marketed under the tradename Veegum available from R.T. Vanderbilt Company, Inc.; and Ultra Talc 2000, 3000, and 5000 available from Ultra Chemical .

D. Aqueous Carrier

5 The compositions of the present invention are typically in the form of pourable liquids (under ambient conditions). The compositions will therefore typically comprise an aqueous carrier, which is present at a level of from about 20% to about 95%, preferably from about 60% to about 85%. The aqueous carrier may comprise water, or a miscible mixture of water and organic solvent, but preferably comprises water with minimal or no significant concentrations of organic
10 solvent, except as otherwise incidentally incorporated into the composition as minor ingredients of other essential or optional components.

E. Additional Components

 The compositions of the present invention may further comprise one or more optional
15 components known for use in hair care or personal care products, provided that the optional components are physically and chemically compatible with the essential components described herein, or do not otherwise unduly impair product stability, aesthetics or performance. Individual concentrations of such optional components may range from about 0.001% to about 10%.

 Non-limiting examples of optional components for use in the composition include
20 cationic polymers, conditioning agents (hydrocarbon oils, fatty esters, silicones), anti dandruff agents, suspending agents, viscosity modifiers, dyes, nonvolatile solvents or diluents (water soluble and insoluble), pearlescent aids, foam boosters, additional surfactants or nonionic cosurfactants, pediculocides, pH adjusting agents, perfumes, preservatives, chelants, proteins, skin active agents, sunscreens, UV absorbers, and vitamins.

25

1. Cationic Polymers

 The compositions of the present invention may contain a cationic polymer to aid in deposition of the solid particle components and enhance conditioning performance. Concentrations of the cationic polymer in the composition typically range from about 0.01% to
30 about 3%, preferably from about 0.05% to about 2.0%, more preferably from about 0.1% to about 1.0%. Suitable cationic polymers will have cationic charge densities of at least about 0.4 meq/gm, preferably at least about 0.9 meq/gm, more preferably at least about 1.2 meq/gm, but also preferably less than about 7 meq/gm, more preferably less than about 5 meq/gm, at the pH of intended use of the shampoo composition, which pH will generally range from about pH 3 to
35 about pH 9, preferably between about pH 4 and about pH 8. Herein, "cationic charge density" of

a polymer refers to the ratio of the number of positive charges on the polymer to the molecular weight of the polymer. The average molecular weight of such suitable cationic polymers will generally be between about 10,000 and 10 million, preferably between about 50,000 and about 5 million, more preferably between about 100,000 and about 3 million.

5 Suitable cationic polymers for use in the compositions of the present invention contain cationic nitrogen-containing moieties such as quaternary ammonium or cationic protonated amino moieties. The cationic protonated amines can be primary, secondary, or tertiary amines (preferably secondary or tertiary), depending upon the particular species and the selected pH of the composition. Any anionic counterions can be used in association with the cationic polymers
10 so long as the polymers remain soluble in water, in the composition, or in a coacervate phase of the composition, and so long as the counterions are physically and chemically compatible with the essential components of the composition or do not otherwise unduly impair product performance, stability or aesthetics. Non limiting examples of such counterions include halides (e.g., chloride, fluoride, bromide, iodide), sulfate and methylsulfate.

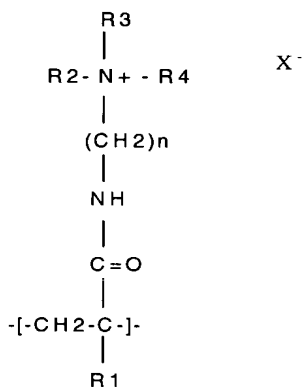
15 Non limiting examples of such polymers are described in the CTFA Cosmetic Ingredient Dictionary, 3rd edition, edited by Estrin, Crosley, and Haynes, (The Cosmetic, Toiletry, and Fragrance Association, Inc., Washington, D.C. (1982)).

 Non limiting examples of suitable cationic polymers include copolymers of vinyl monomers having cationic protonated amine or quaternary ammonium functionalities with water
20 soluble spacer monomers such as acrylamide, methacrylamide, alkyl and dialkyl acrylamides, alkyl and dialkyl methacrylamides, alkyl acrylate, alkyl methacrylate, vinyl caprolactone or vinyl pyrrolidone.

 Suitable cationic protonated amino and quaternary ammonium monomers, for inclusion in the cationic polymers of the composition herein, include vinyl compounds substituted with
25 dialkylaminoalkyl acrylate, dialkylaminoalkyl methacrylate, monoalkylaminoalkyl acrylate, monoalkylaminoalkyl methacrylate, trialkyl methacryloxyalkyl ammonium salt, trialkyl acryloxyalkyl ammonium salt, diallyl quaternary ammonium salts, and vinyl quaternary ammonium monomers having cyclic cationic nitrogen-containing rings such as pyridinium, imidazolium, and quaternized pyrrolidone, e.g., alkyl vinyl imidazolium, alkyl vinyl pyridinium,
30 alkyl vinyl pyrrolidone salts.

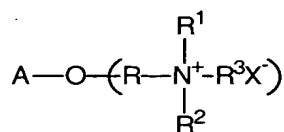
 Other suitable cationic polymers for use in the compositions include copolymers of 1-vinyl-2-pyrrolidone and 1-vinyl-3-methylimidazolium salt (e.g., chloride salt) (referred to in the industry by the Cosmetic, Toiletry, and Fragrance Association, "CTFA", as Polyquaternium-16); copolymers of 1-vinyl-2-pyrrolidone and dimethylaminoethyl methacrylate (referred to in the
35 industry by CTFA as Polyquaternium-11); cationic diallyl quaternary ammonium-containing

polymers, including, for example, dimethyldiallylammonium chloride homopolymer, copolymers of acrylamide and dimethyldiallylammonium chloride (referred to in the industry by CTFA as Polyquaternium 6 and Polyquaternium 7, respectively); amphoteric copolymers of acrylic acid including copolymers of acrylic acid and dimethyldiallylammonium chloride (referred to in the industry by CTFA as Polyquaternium 22), terpolymers of acrylic acid with dimethyldiallylammonium chloride and acrylamide (referred to in the industry by CTFA as Polyquaternium 39), and terpolymers of acrylic acid with methacrylamidopropyl trimethylammonium chloride and methylacrylate (referred to in the industry by CTFA as Polyquaternium 47). Preferred cationic substituted monomers are the cationic substituted dialkylaminoalkyl acrylamides, dialkylaminoalkyl methacrylamides, and combinations thereof. These preferred monomers conform to the Formula (II):



wherein R^1 is hydrogen, methyl or ethyl; each of R^2 , R^3 and R^4 are independently hydrogen or a short chain alkyl having from about 1 to about 8 carbon atoms, preferably from about 1 to about 5 carbon atoms, more preferably from about 1 to about 2 carbon atoms; n is an integer having a value of from about 1 to about 8, preferably from about 1 to about 4; and X is a counterion. The nitrogen attached to R^2 , R^3 and R^4 may be a protonated amine (primary, secondary or tertiary), but is preferably a quaternary ammonium wherein each of R^2 , R^3 and R^4 are alkyl groups a non limiting example of which is polymethacrylamidopropyl trimonium chloride, available under the trade name Polycare 133, from Rhone-Poulenc, Cranberry, N.J., U.S.A.

Other suitable cationic polymers for use in the composition include polysaccharide polymers, such as cationic cellulose derivatives and cationic starch derivatives. Suitable cationic polysaccharide polymers include those which conform to the Formula (III):



wherein A is an anhydroglucose residual group, such as a starch or cellulose anhydroglucose residual; R is an alkylene oxyalkylene, polyoxyalkylene, or hydroxyalkylene group, or combination thereof; R1, R2, and R3 independently are alkyl, aryl, alkylaryl, arylalkyl, alkoxyalkyl, or alkoxyaryl groups, each group containing up to about 18 carbon atoms, and the total number of carbon atoms for each cationic moiety (i.e., the sum of carbon atoms in R1, R2 and R3) preferably being about 20 or less; and X is an anionic counterion as described in hereinbefore.

Preferred cationic cellulose polymers are salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10 and available from Amerchol Corp. (Edison, N.J., USA) in their Polymer LR, JR, and KG series of polymers. Other suitable types of cationic cellulose includes the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium-substituted epoxide referred to in the industry (CTFA) as Polyquaternium 24. These materials are available from Amerchol Corp. under the tradename Polymer LM-200.

Other suitable cationic polymers include cationic guar gum derivatives, such as guar hydroxypropyltrimonium chloride, specific examples of which include the Jaguar series commercially available from Rhone-Poulenc Incorporated and the N-Hance series commercially available from Aqualon Division of Hercules, Inc. Other suitable cationic polymers include quaternary nitrogen-containing cellulose ethers, some examples of which are described in U.S. Pat. No. 3,962,418. Other suitable cationic polymers include copolymers of etherified cellulose, guar and starch, some examples of which are described in U.S. Pat. No. 3,958,581. When used, the cationic polymers herein are either soluble in the composition or are soluble in a complex coacervate phase in the composition formed by the cationic polymer and the anionic, amphoteric and/or zwitterionic detergent surfactant component described hereinbefore. Complex coacervates of the cationic polymer can also be formed with other charged materials in the composition.

Techniques for analysis of formation of complex coacervates are known in the art. For example, microscopic analyses of the compositions, at any chosen stage of dilution, can be utilized to identify whether a coacervate phase has formed. Such coacervate phase will be identifiable as an additional emulsified phase in the composition. The use of dyes can aid in distinguishing the coacervate phase from other insoluble phases dispersed in the composition.

Preferred cationic polymers include polymers of sufficiently high cationic charge density to effectively enhance deposition efficiency of the solid particle components described herein. Preferred cationic polymers comprise cationic cellulose polymers and cationic guar derivatives with cationic charge densities of at least about 1.2 meq/gm, more preferably at least about 1.5 meq/gm, even more preferably at least about 1.7 meq/gm, and still more preferably at least about

1.9 meq/gm, but also preferably less than about 7 meq/gm, more preferably less than about 5 meq/gm, even more preferably less than about 4.5 meq/gm, and even more preferably less than about 3 meq/g. Particularly preferred are cationic cellulose polymers with a charge density of from about 1.5 meq/g to about 3.0 meq/g, even more preferred are cationic cellulose polymers with a charge density of from about 1.7 meq/g to about 2.5 meq/g. Preferred cationic cellulose polymers salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10 and available from Amerchol Corp. (Edison, N.J., USA) as Polymer KG30M with a charge density of 1.9 and a molecular weight of ~1.25 million.

2. Conditioning agents

Conditioning agents include any material which is used to give a particular conditioning benefit to hair and/or skin. In hair treatment compositions, suitable conditioning agents are those which deliver one or more benefits relating to shine, softness, combability, antistatic properties, wet-handling, damage, manageability, body, and greasiness. The conditioning agents useful in the compositions of the present invention typically comprise a water insoluble, water dispersible, non-volatile, liquid that forms emulsified, liquid particles. Suitable conditioning agents for use in the composition are those conditioning agents characterized generally as silicones (e.g., silicone oils, cationic silicones, silicone gums, high refractive silicones, and silicone resins), organic conditioning oils (e.g., hydrocarbon oils, polyolefins, and fatty esters) or combinations thereof, or those conditioning agents which otherwise form liquid, dispersed particles in the aqueous surfactant matrix herein. Such conditioning agents should be physically and chemically compatible with the essential components of the composition, and should not otherwise unduly impair product stability, aesthetics or performance. When used in the composition of the present invention, the ratio of water insoluble, non-volatile liquid conditioning agents to particles is less than about 2:1, preferably less than about 1.5:1, and more preferably less than about 1:1 on a weight basis.

The concentration of the conditioning agent in the composition should be sufficient to provide the desired conditioning benefits, and as will be apparent to one of ordinary skill in the art. Such concentration can vary with the conditioning agent, the conditioning performance desired, the average size of the conditioning agent particles, the type and concentration of other components, and other like factors.

a. Silicones

The conditioning agent of the compositions of the present invention is preferably an insoluble silicone conditioning agent. The silicone conditioning agent particles may comprise volatile silicone, non-volatile silicone, or combinations thereof. Preferred are non-volatile silicone

conditioning agents. If volatile silicones are present, it will typically be incidental to their use as a solvent or carrier for commercially available forms of non-volatile silicone materials ingredients, such as silicone gums and resins. The silicone conditioning agent particles may comprise a silicone fluid conditioning agent and may also comprise other ingredients, such as a silicone resin to improve silicone fluid deposition efficiency or enhance glossiness of the hair.

The concentration of the silicone conditioning agent typically ranges from about 0.01% to about 10%, preferably from about 0.1% to about 8%, more preferably from about 0.1% to about 5%, more preferably from about 0.2% to about 3%. Non-limiting examples of suitable silicone conditioning agents, and optional suspending agents for the silicone, are described in U.S. Reissue Pat. No. 34,584, U.S. Pat. No. 5,104,646, and U.S. Pat. No. 5,106,609. The silicone conditioning agents for use in the compositions of the present invention preferably have a viscosity, as measured at 25°C, from about 20 to about 2,000,000 centistokes ("csk"), more preferably from about 1,000 to about 1,800,000 csk, even more preferably from about 50,000 to about 1,500,000 csk, more preferably from about 100,000 to about 1,500,000 csk.

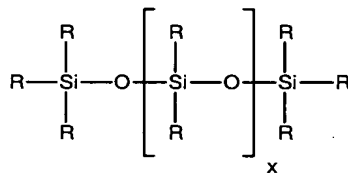
The dispersed silicone conditioning agent particles typically have a number average particle diameter ranging from about 0.01 μ m to about 50 μ m. For small particle application to hair, the number average particle diameters typically range from about 0.01 μ m to about 4 μ m, preferably from about 0.01 μ m to about 2 μ m, more preferably from about 0.01 μ m to about 0.5 μ m. For larger particle application to hair, the number average particle diameters typically range from about 4 μ m to about 50 μ m, preferably from about 6 μ m to about 30 μ m, more preferably from about 9 μ m to about 20 μ m, more preferably from about 12 μ m to about 18 μ m.

Background material on silicones including sections discussing silicone fluids, gums, and resins, as well as manufacture of silicones, are found in *Encyclopedia of Polymer Science and Engineering*, vol. 15, 2d ed., pp 204-308, John Wiley & Sons, Inc. (1989).

i. Silicone oils

Silicone fluids include silicone oils, which are flowable silicone materials having a viscosity, as measured at 25°C, less than 1,000,000 csk, preferably from about 5 csk to about 1,000,000 csk, more preferably from about 100 csk to about 600,000 csk. Suitable silicone oils for use in the compositions of the present invention include polyalkyl siloxanes, polyaryl siloxanes, polyalkylaryl siloxanes, polyether siloxane copolymers, and mixtures thereof. Other insoluble, non-volatile silicone fluids having hair conditioning properties may also be used.

Silicone oils include polyalkyl or polyaryl siloxanes which conform to the following Formula (IV):

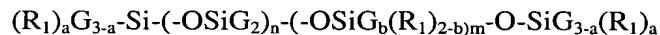


wherein R is aliphatic, preferably alkyl or alkenyl, or aryl, R can be substituted or unsubstituted, and x is an integer from 1 to about 8,000. Suitable R groups for use in the compositions of the present invention include, but are not limited to: alkoxy, aryloxy, alkaryl, arylalkyl, arylalkenyl, alkamino, and ether-substituted, hydroxyl-substituted, and halogen-substituted aliphatic and aryl groups. Suitable R groups also include cationic amines and quaternary ammonium groups.

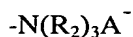
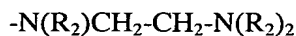
Preferred alkyl and alkenyl substituents are C₁ to C₅ alkyls and alkenyls, more preferably from C₁ to C₄, more preferably from C₁ to C₂. The aliphatic portions of other alkyl-, alkenyl-, or alkynyl-containing groups (such as alkoxy, alkaryl, and alkamino) can be straight or branched chains, and are preferably from C₁ to C₅, more preferably from C₁ to C₄, even more preferably from C₁ to C₃, more preferably from C₁ to C₂. As discussed above, the R substituents can also contain amino functionalities (e.g. alkamino groups), which can be primary, secondary or tertiary amines or quaternary ammonium. These include mono-, di- and tri- alkylamino and alkoxyamino groups, wherein the aliphatic portion chain length is preferably as described herein.

ii. Amino and Cationic silicones

Cationic silicone fluids suitable for use in the compositions of the present invention include, but are not limited to, those which conform to the general Formula (V):



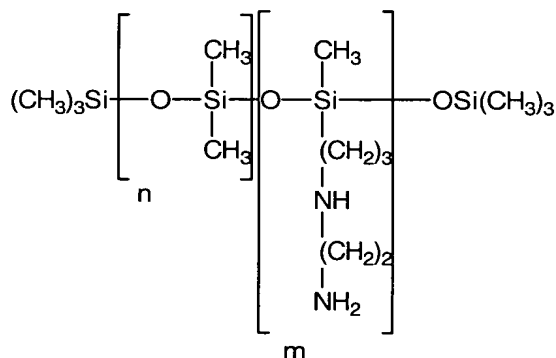
wherein G is hydrogen, phenyl, hydroxy, or C₁-C₈ alkyl, preferably methyl; a is 0 or an integer having a value from 1 to 3, preferably 0; b is 0 or 1, preferably 1; n is a number from 0 to 1,999, preferably from 49 to 499; m is an integer from 1 to 2,000, preferably from 1 to 10; the sum of n and m is a number from 1 to 2,000, preferably from 50 to 500; R₁ is a monovalent radical conforming to the general formula C_qH_{2q}L, wherein q is an integer having a value from 2 to 8 and L is selected from the following groups:



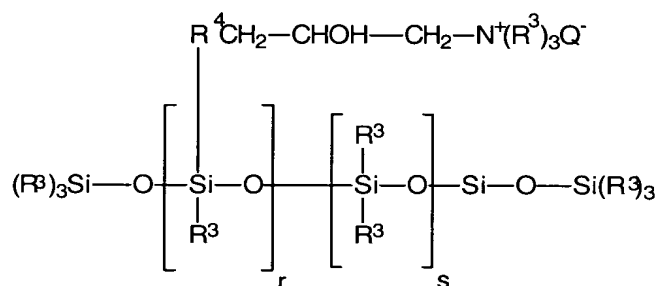


wherein R_2 is hydrogen, phenyl, benzyl, or a saturated hydrocarbon radical, preferably an alkyl radical from about C_1 to about C_{20} , and A^- is a halide ion.

- 5 An especially preferred cationic silicone corresponding to Formula (V) is the polymer known as "trimethylsilylamodimethicone", which is shown below in Formula (VI):



- 10 Other silicone cationic polymers which may be used in the compositions of the present invention are represented by the general Formula (VII):



- 15 wherein R^3 is a monovalent hydrocarbon radical from C_1 to C_{18} , preferably an alkyl or alkenyl radical, such as methyl; R^4 is a hydrocarbon radical, preferably a C_1 to C_{18} alkylene radical or a C_{10} to C_{18} alkyleneoxy radical, more preferably a C_1 to C_8 alkyleneoxy radical; Q^- is a halide ion, preferably chloride; r is an average statistical value from 2 to 20, preferably from 2 to 8; s is an average statistical value from 20 to 200, preferably from 20 to 50. A preferred polymer of this class is known as UCARE SILICONE ALE 56™, available from Union Carbide.

20 **iii. Silicone gums**

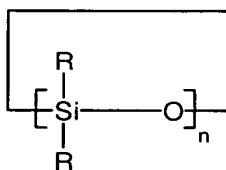
Other silicone fluids suitable for use in the compositions of the present invention are the

insoluble silicone gums. These gums are polyorganosiloxane materials having a viscosity, as measured at 25°C, of greater than or equal to 1,000,000 csk. Silicone gums are described in U.S. Pat. No. 4,152,416; Noll and Walter, *Chemistry and Technology of Silicones*, New York: Academic Press (1968); and in General Electric Silicone Rubber Product Data Sheets SE 30, SE 33, SE 54 and SE 76. Specific non-limiting examples of silicone gums for use in the compositions of the present invention include polydimethylsiloxane, (polydimethylsiloxane) (methylvinylsiloxane) copolymer, poly(dimethylsiloxane) (diphenyl siloxane)(methylvinylsiloxane) copolymer and mixtures thereof.

iv. High refractive index silicones

Other non-volatile, insoluble silicone fluid conditioning agents that are suitable for use in the compositions of the present invention are those known as "high refractive index silicones," having a refractive index of at least about 1.46, preferably at least about 1.48, more preferably at least about 1.52, more preferably at least about 1.55. The refractive index of the polysiloxane fluid will generally be less than about 1.70, typically less than about 1.60. In this context, polysiloxane "fluid" includes oils as well as gums.

The high refractive index polysiloxane fluid includes those represented by general Formula (IV) above, as well as cyclic polysiloxanes such as those represented by Formula (VIII) below:



wherein R is as defined above, and n is a number from about 3 to about 7, preferably from about 3 to about 5.

The high refractive index polysiloxane fluids contain an amount of aryl-containing R substituents sufficient to increase the refractive index to the desired level, which is described herein. Additionally, R and n must be selected so that the material is non-volatile.

Aryl-containing substituents include those which contain alicyclic and heterocyclic five and six member aryl rings and those which contain fused five or six member rings. The aryl rings themselves can be substituted or unsubstituted.

Generally, the high refractive index polysiloxane fluids will have a degree of aryl-containing substituents of at least about 15%, preferably at least about 20%, more preferably

at least about 25%, even more preferably at least about 35%, more preferably at least about 50%. Typically, the degree of aryl substitution will be less than about 90%, more generally less than about 85%, preferably from about 55% to about 80%.

5 Preferred high refractive index polysiloxane fluids have a combination of phenyl or phenyl derivative substituents (more preferably phenyl), with alkyl substituents, preferably C₁-C₄ alkyl (more preferably methyl), hydroxy, or C₁-C₄ alkylamino (especially -R¹NHR²NH₂ wherein each R¹ and R² independently is a C₁-C₃ alkyl, alkenyl, and/or alkoxy).

10 When high refractive index silicones are used in the compositions of the present invention, they are preferably used in solution with a spreading agent, such as a silicone resin or a surfactant, to reduce the surface tension by a sufficient amount to enhance spreading and thereby enhance the glossiness (subsequent to drying) of hair treated with the compositions.

Silicone fluids suitable for use in the compositions of the present invention are disclosed in U.S. Pat. No. 2,826,551, U.S. Pat. No. 3,964,500, U.S. Pat. No. 4,364,837, British Pat. No. 849,433, and *Silicon Compounds*, Petrarch Systems, Inc. (1984).

15 v. Silicone resins

Silicone resins may be included in the silicone conditioning agent of the compositions of the present invention. These resins are highly cross-linked polymeric siloxane systems. The cross-linking is introduced through the incorporation of trifunctional and tetrafunctional silanes with monofunctional or difunctional, or both, silanes during manufacture of the silicone resin.

20 Silicone materials and silicone resins in particular, can conveniently be identified according to a shorthand nomenclature system known to those of ordinary skill in the art as "MDTQ" nomenclature. Under this system, the silicone is described according to presence of various siloxane monomer units which make up the silicone. Briefly, the symbol M denotes the monofunctional unit (CH₃)₃SiO_{0.5}; D denotes the difunctional unit (CH₃)₂SiO; T denotes the trifunctional unit (CH₃)SiO_{1.5}; and Q denotes the quadra- or tetra-functional unit SiO₂. Primes of the unit symbols (e.g. M', D', T', and Q') denote substituents other than methyl, and must be specifically defined for each occurrence.

25 Preferred silicone resins for use in the compositions of the present invention include, but are not limited to MQ, MT, MTQ, MDT and MDTQ resins. Methyl is a preferred silicone substituent. Especially preferred silicone resins are MQ resins, wherein the M:Q ratio is from about 0.5:1.0 to about 1.5:1.0 and the average molecular weight of the silicone resin is from about 1000 to about 10,000.

b. Organic conditioning oils

35 The conditioning component of the compositions of the present invention may also comprise from about 0.05% to about 3%, preferably from about 0.08% to about 1.5%, more

preferably from about 0.1% to about 1%, of at least one organic conditioning oil as the conditioning agent, either alone or in combination with other conditioning agents, such as the silicones (described herein).

i. Hydrocarbon oils

Suitable organic conditioning oils for use as conditioning agents in the compositions of the present invention include, but are not limited to, hydrocarbon oils having at least about 10 carbon atoms, such as cyclic hydrocarbons, straight chain aliphatic hydrocarbons (saturated or unsaturated), and branched chain aliphatic hydrocarbons (saturated or unsaturated), including polymers and mixtures thereof. Straight chain hydrocarbon oils preferably are from about C₁₂ to about C₁₉. Branched chain hydrocarbon oils, including hydrocarbon polymers, typically will contain more than 19 carbon atoms.

Specific non-limiting examples of these hydrocarbon oils include paraffin oil, mineral oil, saturated and unsaturated dodecane, saturated and unsaturated tridecane, saturated and unsaturated tetradecane, saturated and unsaturated pentadecane, saturated and unsaturated hexadecane, polybutene, polydecene, and mixtures thereof. Branched-chain isomers of these compounds, as well as of higher chain length hydrocarbons, can also be used, examples of which include highly branched, saturated or unsaturated, alkanes such as the permethyl-substituted isomers, e.g., the permethyl-substituted isomers of hexadecane and eicosane, such as 2, 2, 4, 4, 6, 6, 8, 8-dimethyl-10-methylundecane and 2, 2, 4, 4, 6, 6-dimethyl-8-methylnonane, available from Permethyl Corporation. Hydrocarbon polymers such as polybutene and polydecene. A preferred hydrocarbon polymer is polybutene, such as the copolymer of isobutylene and butene. A commercially available material of this type is L-14 polybutene from Amoco Chemical Corporation. The concentration of such hydrocarbon oils in the composition preferably range from about 0.05% to about 20%, more preferably from about 0.08% to about 1.5%, and even more preferably from about 0.1% to about 1%.

ii. Polyolefins

Organic conditioning oils for use in the compositions of the present invention can also include liquid polyolefins, more preferably liquid poly- α -olefins, more preferably hydrogenated liquid poly- α -olefins. Polyolefins for use herein are prepared by polymerization of C₄ to about C₁₄ olefinic monomers, preferably from about C₆ to about C₁₂.

Non-limiting examples of olefinic monomers for use in preparing the polyolefin liquids herein include ethylene, propylene, 1-butene, 1-pentene, 1-hexene, 1-octene, 1-decene, 1-dodecene, 1-tetradecene, branched chain isomers such as 4-methyl-1-pentene, and mixtures thereof. Also suitable for preparing the polyolefin liquids are olefin-containing refinery feedstocks or effluents. Preferred hydrogenated α -olefin monomers include, but are not limited

to: 1-hexene to 1-hexadecenes, 1-octene to 1-tetradecene, and mixtures thereof.

iii. Fatty Esters

Other suitable organic conditioning oils for use as the conditioning agent in the compositions of the present invention include, but are not limited to, fatty esters having at least 10 carbon atoms. These fatty esters include esters with hydrocarbyl chains derived from fatty acids or alcohols (e.g. mono-esters, polyhydric alcohol esters, and di- and tri-carboxylic acid esters). The hydrocarbyl radicals of the fatty esters hereof may include or have covalently bonded thereto other compatible functionalities, such as amides and alkoxy moieties (e.g., ethoxy or ether linkages, etc.).

Specific examples of preferred fatty esters include, but are not limited to: isopropyl isostearate, hexyl laurate, isohexyl laurate, isohexyl palmitate, isopropyl palmitate, decyl oleate, isodecyl oleate, hexadecyl stearate, decyl stearate, isopropyl isostearate, dihexyldecyl adipate, lauryl lactate, myristyl lactate, cetyl lactate, oleyl stearate, oleyl oleate, oleyl myristate, lauryl acetate, cetyl propionate, and oleyl adipate.

Other fatty esters suitable for use in the compositions of the present invention are mono-carboxylic acid esters of the general formula $R'COOR$, wherein R' and R are alkyl or alkenyl radicals, and the sum of carbon atoms in R' and R is at least 10, preferably at least 22.

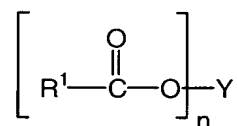
Still other fatty esters suitable for use in the compositions of the present invention are di- and tri-alkyl and alkenyl esters of carboxylic acids, such as esters of C_4 to C_8 dicarboxylic acids (e.g. C_1 to C_{22} esters, preferably C_1 to C_6 , of succinic acid, glutaric acid, and adipic acid). Specific non-limiting examples of di- and tri- alkyl and alkenyl esters of carboxylic acids include isocetyl stearyl stearate, diisopropyl adipate, and tristearyl citrate.

Other fatty esters suitable for use in the compositions of the present invention are those known as polyhydric alcohol esters. Such polyhydric alcohol esters include alkylene glycol esters, such as ethylene glycol mono and di-fatty acid esters, diethylene glycol mono- and di-fatty acid esters, polyethylene glycol mono- and di-fatty acid esters, propylene glycol mono- and di-fatty acid esters, polypropylene glycol monooleate, polypropylene glycol 2000 monostearate, ethoxylated propylene glycol monostearate, glyceryl mono- and di-fatty acid esters, polyglycerol poly-fatty acid esters, ethoxylated glyceryl monostearate, 1,3-butylene glycol monostearate, 1,3-butylene glycol distearate, polyoxyethylene polyol fatty acid ester, sorbitan fatty acid esters, and polyoxyethylene sorbitan fatty acid esters.

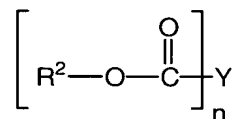
Still other fatty esters suitable for use in the compositions of the present invention are glycerides, including, but not limited to, mono-, di-, and tri-glycerides, preferably di- and tri-glycerides, more preferably triglycerides. For use in the compositions described herein, the glycerides are preferably the mono-, di-, and tri-esters of glycerol and long chain carboxylic acids,

such as C₁₀ to C₂₂ carboxylic acids. A variety of these types of materials can be obtained from vegetable and animal fats and oils, such as castor oil, safflower oil, cottonseed oil, corn oil, olive oil, cod liver oil, almond oil, avocado oil, palm oil, sesame oil, lanolin and soybean oil. Synthetic oils include, but are not limited to, triolein and tristearin glyceryl dilaurate.

- 5 Other fatty esters suitable for use in the compositions of the present invention are water insoluble synthetic fatty esters. Some preferred synthetic esters conform to the general Formula (IX):



- 10 wherein R¹ is a C₇ to C₉ alkyl, alkenyl, hydroxyalkyl or hydroxyalkenyl group, preferably a saturated alkyl group, more preferably a saturated, linear, alkyl group; n is a positive integer having a value from 2 to 4, preferably 3; and Y is an alkyl, alkenyl, hydroxy or carboxy substituted alkyl or alkenyl, having from about 2 to about 20 carbon atoms, preferably from about 3 to about 14 carbon atoms. Other preferred synthetic esters conform to the general Formula (X):



- 15 wherein R² is a C₈ to C₁₀ alkyl, alkenyl, hydroxyalkyl or hydroxyalkenyl group; preferably a saturated alkyl group, more preferably a saturated, linear, alkyl group; n and Y are as defined above in Formula (X).

- Specific non-limiting examples of suitable synthetic fatty esters for use in the compositions of the present invention include: P-43 (C₈-C₁₀ triester of trimethylolpropane), MCP-
20 684 (tetraester of 3,3 diethanol-1,5 pentadiol), MCP 121 (C₈-C₁₀ diester of adipic acid), all of which are available from Mobil Chemical Company.

c. Other conditioning agents

- Also suitable for use in the compositions herein are the conditioning agents described by the Procter & Gamble Company in U.S. Pat. Nos. 5,674,478, and 5,750,122. Also suitable for use
25 herein are those conditioning agents described in U.S. Pat. Nos. 4,529,586 (Clairol), 4,507,280 (Clairol), 4,663,158 (Clairol), 4,197,865 (L'Oreal), 4,217, 914 (L'Oreal), 4,381,919 (L'Oreal), and 4,422, 853 (L'Oreal).

3. Anti-dandruff Actives

- The compositions of the present invention may also contain an anti-dandruff agent.
30 Suitable, non-limiting examples of anti-dandruff particulates include: pyridinethione salts, azoles, selenium sulfide, particulate sulfur, and mixtures thereof. Preferred are pyridinethione salts.

Such anti-dandruff particulate should be physically and chemically compatible with the essential components of the composition, and should not otherwise unduly impair product stability, aesthetics or performance.

Pyridinethione anti-dandruff particulates, especially 1-hydroxy-2-pyridinethione salts, are highly preferred particulate anti-dandruff agents for use in compositions of the present invention. The concentration of pyridinethione anti-dandruff particulate typically ranges from about 0.1% to about 4%, by weight of the composition, preferably from about 0.1% to about 3%, more preferably from about 0.3% to about 2%. Preferred pyridinethione salts include those formed from heavy metals such as zinc, tin, cadmium, magnesium, aluminum and zirconium, preferably zinc, more preferably the zinc salt of 1-hydroxy-2-pyridinethione (known as "zinc pyridinethione" or "ZPT"), more preferably 1-hydroxy-2-pyridinethione salts in platelet particle form, wherein the particles have an average size of up to about 20 μ , preferably up to about 5 μ , more preferably up to about 2.5 μ . Salts formed from other cations, such as sodium, may also be suitable. Pyridinethione anti-dandruff agents are described, for example, in U.S. Pat. No. 2,809,971; U.S. Pat. No. 3,236,733; U.S. Pat. No. 3,753,196; U.S. Pat. No. 3,761,418; U.S. Pat. No. 4,345,080; U.S. Pat. No. 4,323,683; U.S. Pat. No. 4,379,753; and U.S. Pat. No. 4,470,982. It is contemplated that when ZPT is used as the anti-dandruff particulate in the compositions herein, that the growth or re-growth of hair may be stimulated or regulated, or both, or that hair loss may be reduced or inhibited, or that hair may appear thicker or fuller.

4. Humectant

The compositions of the present invention may contain a humectant. The humectants herein are selected from the group consisting of polyhydric alcohols, water soluble alkoxylated nonionic polymers, and mixtures thereof. The humectants, when used herein, are preferably used at levels of from about 0.1% to about 20%, more preferably from about 0.5% to about 5%.

Polyhydric alcohols useful herein include glycerin, sorbitol, propylene glycol, butylene glycol, hexylene glycol, ethoxylated glucose, 1, 2-hexane diol, hexanetriol, dipropylene glycol, erythritol, trehalose, diglycerin, xylitol, maltitol, maltose, glucose, fructose, sodium chondroitin sulfate, sodium hyaluronate, sodium adenosine phosphate, sodium lactate, pyrrolidone carbonate, glucosamine, cyclodextrin, and mixtures thereof.

Water soluble alkoxylated nonionic polymers useful herein include polyethylene glycols and polypropylene glycols having a molecular weight of up to about 1000 such as those with CTFA names PEG-200, PEG-400, PEG-600, PEG-1000, and mixtures thereof.

5. Suspending Agent

The compositions of the present invention may further comprise a suspending agent at concentrations effective for suspending water-insoluble material in dispersed form in the

compositions or for modifying the viscosity of the composition. Such concentrations range from about 0.1% to about 10%, preferably from about 0.3% to about 5.0%.

Suspending agents useful herein include anionic polymers and nonionic polymers. Useful herein are vinyl polymers such as cross linked acrylic acid polymers with the CTFA name Carbomer, cellulose derivatives and modified cellulose polymers such as methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxypropyl methyl cellulose, nitro cellulose, sodium cellulose sulfate, sodium carboxymethyl cellulose, crystalline cellulose, cellulose powder, polyvinylpyrrolidone, polyvinyl alcohol, guar gum, hydroxypropyl guar gum, xanthan gum, arabia gum, tragacanth, galactan, carob gum, guar gum, karaya gum, carrageenin, pectin, agar, quince seed (*Cydonia oblonga* Mill), starch (rice, corn, potato, wheat), algae colloids (algae extract), microbiological polymers such as dextran, succinoglucan, pulleran, starch-based polymers such as carboxymethyl starch, methylhydroxypropyl starch, alginic acid-based polymers such as sodium alginate, alginic acid propylene glycol esters, acrylate polymers such as sodium polyacrylate, polyethylacrylate, polyacrylamide, polyethyleneimine, and inorganic water soluble material such as bentonite, aluminum magnesium silicate, laponite, hectonite, and anhydrous silicic acid.

Commercially available viscosity modifiers highly useful herein include Carbomers with tradenames Carbopol 934, Carbopol 940, Carbopol 950, Carbopol 980, Carbopol 981, Carbopol ETD 2010, Carbopol ETD 2050, Carbopol Ultrez 10, and Carbopol Aqua SF-1 all available from Noveon, Inc., acrylates/stearate-20 methacrylate copolymer with tradename ACRYCOL 22 available from Rohm and Hass, nonoxynyl hydroxyethylcellulose with tradename AMERCELL POLYMER HM-1500 available from Amerchol, methylcellulose with tradename BENECEL, hydroxyethyl cellulose with tradename NATROSOL, hydroxypropyl cellulose with tradename KLUCEL, cetyl hydroxyethyl cellulose with tradename POLYSURF 67, all supplied by Hercules, ethylene oxide and/or propylene oxide based polymers with tradenames CARBOWAX PEGs, POLYOX WASRs, and UCON FLUIDS, all supplied by Amerchol.

Other optional suspending agents include crystalline suspending agents which can be categorized as acyl derivatives, long chain amine oxides, and mixtures thereof. These suspending agents are described in U.S. Pat. No. 4,741,855. These preferred suspending agents include ethylene glycol esters of fatty acids preferably having from about 16 to about 22 carbon atoms. More preferred are the ethylene glycol stearates, both mono and distearate, but particularly the distearate containing less than about 7% of the mono stearate. Other suitable suspending agents include alkanol amides of fatty acids, preferably having from about 16 to about 22 carbon atoms, more preferably about 16 to 18 carbon atoms, preferred examples of which include stearic monoethanolamide, stearic diethanolamide, stearic monoisopropanolamide and stearic

monoethanolamide stearate. Other long chain acyl derivatives include long chain esters of long chain fatty acids (e.g., stearyl stearate, cetyl palmitate, etc.); long chain esters of long chain alkanol amides (e.g., stearamide diethanolamide distearate, stearamide monoethanolamide stearate); and glyceryl esters (e.g., glyceryl distearate, trihydroxystearin, tribehenin) a commercial example of which is Thixin R available from Rheox, Inc. Long chain acyl derivatives, ethylene glycol esters of long chain carboxylic acids, long chain amine oxides, and alkanol amides of long chain carboxylic acids in addition to the preferred materials listed above may be used as suspending agents.

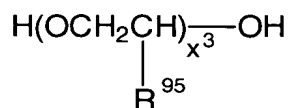
Other long chain acyl derivatives suitable for use as suspending agents include N,N-dihydrocarbyl amido benzoic acid and soluble salts thereof (e.g., Na, K), particularly N,N-di(hydrogenated) C.sub.16, C.sub.18 and tallow amido benzoic acid species of this family, which are commercially available from Stepan Company (Northfield, Ill., USA).

Examples of suitable long chain amine oxides for use as suspending agents include alkyl dimethyl amine oxides, e.g., stearyl dimethyl amine oxide.

Other suitable suspending agents include primary amines having a fatty alkyl moiety having at least about 16 carbon atoms, examples of which include palmitamine or stearamine, and secondary amines having two fatty alkyl moieties each having at least about 12 carbon atoms, examples of which include dipalmitoylamine or di(hydrogenated tallow)amine. Still other suitable suspending agents include di(hydrogenated tallow)phthalic acid amide, and crosslinked maleic anhydride-methyl vinyl ether copolymer.

6. Nonionic polymers

Polyalkylene glycols having a molecular weight of more than about 1000 are useful herein. Useful are those having the following general Formula (XI):



wherein R⁹⁵ is selected from the group consisting of H, methyl, and mixtures thereof. In the above structure, x³ has an average value of from about 1500 to about 120,000, preferably from about 3,000 to about 100,000, and more preferably from about 5,000 to about 50,000

Polyethylene glycol polymers useful herein are PEG-2M wherein R⁹⁵ equals H and x³ has an average value of about 2,000 (PEG-2M is also known as Polyox WSR[®] N-10, which is available from Dow/ Amerchol and as PEG-2,000); PEG-5M wherein R⁹⁵ equals H and x³ has an average value of about 5,000 (PEG-5M is also known as Polyox WSR[®] N-35 and Polyox WSR[®] N-80, both available from Dow/ Amerchol and as PEG-5,000 and Polyethylene Glycol 300,000);

PEG-7M wherein R⁹⁵ equals H and x3 has an average value of about 7,000 (PEG-7M is also known as Polyox WSR[®] N-750 available from Dow/ Amerchol); PEG-9M wherein R⁹⁵ equals H and x3 has an average value of about 9,000 (PEG 9-M is also known as Polyox WSR[®] N-3333 available from Dow/ Amerchol); PEG-14 M wherein R⁹⁵ equals H and x3 has an average value of about 14,000 (PEG-14M is also known as Polyox WSR[®] N-3000 available from Dow/ Amerchol); PEG-45M wherein R⁹⁵ equals H and x3 has an average value of about 45,000 (PEG-45M is also known as Polyox WSR[®] N-60K available from Dow/ Amerchol); and PEG-90M wherein R⁹⁵ equals H and x3 has an average value of about 90,000 (PEG-90M is also known as Polyox WSR[®]-301 available from Dow/ Amerchol).

- 10 Other useful polymers include the polypropylene glycols and mixed polyethylene-polypropylene glycols, or polyoxyethylene-polyoxypropylene copolymer polymers.

7. Other Optional Components

The compositions of the present invention may contain also vitamins and amino acids such as: water soluble vitamins such as vitamin B1, B2, B6, B12, C, pantothenic acid, pantothenyl ethyl ether, panthenol, biotin, and their derivatives, water soluble amino acids such as asparagine, alanin, indole, glutamic acid and their salts, water insoluble vitamins such as vitamin A, D, E, and their derivatives, water insoluble amino acids such as tyrosine, tryptamine, and their salts.

The compositions of the present invention may also contain pigment materials such as inorganic, nitroso, monoazo, disazo, carotenoid, triphenyl methane, triaryl methane, xanthene, quinoline, oxazine, azine, anthraquinone, indigoid, thionindigoid, quinacridone, phthalocianine, botanical, natural colors, including: water soluble components such as those having C. I. Names.

The compositions of the present invention may also contain antimicrobial agents which are useful as cosmetic biocides and antidandruff agents including: water soluble components such as piroctone olamine, water insoluble components such as 3,4,4'- trichlorocarbanilide (trichlosan), triclocarban and zinc pyrithione.

The compositions of the present invention may also contain chelating agents.

FRICTION TEST

After treatment with the compositions of the present invention, hair will preferably demonstrate a friction coefficient of from about 1 to about 2. More preferably, the hair will demonstrate a friction coefficient of from about 1.05 to about 1.8. Still more preferably, the hair will demonstrate a friction coefficient of from about 1.1 to about 1.7. Even more preferably, the hair will demonstrate a friction coefficient of from about 1.2 to about 1.6. The friction coefficient is determined according to the following method:

The method measures the change in friction of an untreated versus treated hair switch. A weighted "sled" (~4.6 mm X 3.1 mm) weighing 73g +/- 5% and covered with a nylon mesh of approximately 105 micron pore size is attached to a force measurement device such as an Instron and pulled at a constant speed across a 20 g hair switch (approximately 10 inches in length) that is clamped on one end.

The hair that is used is Caucasian hair that has been formed into 20 gram switches that are ten inches in length which has been cleaned to remove any foreign soils. The hair switches are then allowed to equilibrate in a constant temperature room at 75°C / 50% relative humidity (RH) overnight.

The hair switches are treated as follows: The switches are pre-wetted under the running tap water. The excess water is squeezed out and the switch is hung on a rack. For leave-on products, 1.5cc of the test product is then applied to the surface of the hair switch and rubbed into the switch for ~30-40 sec. For rinse-off products, the test product is applied to the wet hair at a dose of 0.1g/g and massaged/ lathered for approximately 30 seconds followed by approximately 30 seconds of water rinsing at a flow rate of approximately 1.5 gallon/minute and the process repeated to complete one treatment cycle. Switches are then dried and the previously described treatment cycle is repeated for a total of 3 cycles. After treatment, the switches are re-hung on the rack and placed in a constant temperature room (75°C / 50% RH) to equilibrate overnight.

The switch to be tested is clamped into position on a horizontal testing stand and combed 2-3 times to orient the hair and remove tangles. The "sled" is then attached and placed on the hair switch. Friction is measured on three separate switches in the forward direction (toward tip end of hair) by pulling the "sled" at a rate of approximately 1 cm/sec while measuring the tension force (typically measured in grams). Each force measurement is an average of at least ten values recorded over a distance of at least 5 cm once the "sled" has reached constant speed. A minimum of three measurements are taken for each switch. The friction coefficient is determined as the average ratio of the friction of the treated hair switch divided by the friction of the untreated hair switch.

WET/CONDITION FEEL METHOD

After treatment with the compositions of the present invention, hair will preferably demonstrate a conditioning benefit. A method measuring conditioning involves treating identical hair switches with compositions to be evaluated, which were then subjected to a paired comparison test by trained panelists for various conditioning attributes including "slippery feel during rinsing," "smooth feel on rewetting", and "combing ease."

METHOD OF MAKING

The compositions of the present invention, in general, may be made by mixing the ingredients together at either room temperature or at elevated temperature, e.g., about 72.degree.

C. Heat only needs to be used if solid ingredients are in the composition. The ingredients are mixed at the batch processing temperature. Additional ingredients, including electrolytes, polymers, and particles, may be added to the product at room temperature.

METHOD OF USE

The personal cleansing compositions of the present invention are used in a conventional manner for cleansing and conditioning hair or skin. An effective amount of the composition for cleansing and conditioning the hair or skin is applied to the hair or skin, that has preferably been wetted with water, and then rinsed off. Such effective amounts generally range from about 1gm to about 50gm, preferably from about 1gm to about 20gm. Application to the hair typically includes working the composition through the hair such that most or all of the hair is contacted with the composition.

This method for cleansing and conditioning the hair or skin comprises the steps of:

a) wetting the hair or skin with water, b) applying an effective amount of the personal cleansing composition to the hair or skin, and c) rinsing the applied areas of skin or hair with water. These steps can be repeated as many times as desired to achieve the desired cleansing and conditioning benefit.

NON-LIMITING EXAMPLES

The compositions illustrated in the following Examples illustrate specific embodiments of the compositions of the present invention, but are not intended to be limiting thereof. Other modifications can be undertaken by the skilled artisan without departing from the spirit and scope of this invention. These exemplified embodiments of the composition of the present invention provide cleansing of hair and volumizing benefits with good wet conditioning and combing performance.

The compositions illustrated in the following Examples are prepared by conventional formulation and mixing methods, an example of which is set forth hereinbelow. All exemplified amounts are listed as weight percents and exclude minor materials such as diluents, preservatives, color solutions, imagery ingredients, botanicals, and so forth, unless otherwise specified.

The compositions of the present invention may be prepared using conventional formulation and mixing techniques. Where melting or dissolution of solid surfactants or wax components is required these can be added to a premix of the surfactants, or some portion of the surfactants, mixed and heated to melt the solid components, e.g., about 72° C. This mixture can then optionally be processed through a high shear mill and cooled, and then the remaining components are mixed in. The hollow particle component can be added either prior to processing

through a high shear mill or preferably added to this final mix, after cooling. The compositions typically have a final viscosity of from about 2000 to about 20,000 cps. The viscosity of the composition can be adjusted by conventional techniques including addition of sodium chloride or ammonium xylenesulfonate as needed. The listed formulations, therefore, comprise the listed components and any minor materials associated with such components.

EXAMPLE COMPOSITION	1	2	3	4	5	6	7	8	9	10
Ammonium Laureth Sulfate	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	8.00	15.00
Ammonium Lauryl Sulfate	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	5.00
Polyquaternium-10 (1)	0.25	0.25	0.25	0.25	0.25	0.50	0.25	0.10	0.30	0.50
PEG 90M (2)					0.20					
trihydroxystearin (3)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Perfume Solution	0.55	0.55	0.70	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Sodium Citrate	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Citric Acid	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sodium Hydroxide 50%										
Sodium Chloride	0.50	0.50	0.50	0.50	0.45	0.45	0.45	0.45	0.45	0.45
precipitated silica (4)	0.25	0.25	0.25	0.25	0.25					0.50
precipitated silica (5)						0.50			0.30	
hydrophobic precipitated silica (6)							0.25	0.20		
polymethylsilsesquioxane (7)	0.75									
polymethylsilsesquioxane (8)		0.75								
polyethylene (9)			0.75				1.00			1.00
nylon-12 (10)						2.00				
spherical silica MSS-500/N (11)				0.75				0.80	1.00	
spherical silica MSS-500/H (12)					0.75					
Water and Minors (QS to 100%)										

(1) Polymer KG30M available from Amerchol [charge density = 1.9 meq/g, molecular weight ~ 2,000,000]

(2) Polyox WSR-301 available from Amerchol/ Dow Chemical Company

(3) Thixin R available from Rheox, Inc.

(4) Sipernat 22LS available from Degussa [particle size approximately 4 micron, specific surface area approximately 175 sq. meter/ gram]

(5) Sipernat 360 available from Degussa Corp. [particle size approximately 15 micron, specific surface area approximately 50 sq. meter/ gram]

(6) Sipernat D11 available from Degussa [particle size approximately 4 micron]

(7) Tospearl 3120 available from GE Silicones [particle size approximately 12 micron, specific surface area approximately 18 sq. meter/ gram]

(8) Tospearl 130 available from GE Silicones [particle size approximately 3 micron, specific surface area approximately 20 sq. meter/ gram]

(9) Microthene FN51000 available from Quantum Chemical [particle size approximately 15 microns]

(10) SP-10 available from KOBOL Products, Inc [particle size approximately 10 microns]

(11) available from KOBOL Products Inc. [particle size approximately 12 micron, specific surface area approximately 80 sq. meter/gram]

(12) available from KOBOL Products Inc. [particle size approximately 12 micron, specific surface area approximately 750 sq. meter/gram]

The compositions of Examples 1, 2, and 3 were tested according to the friction method described herein and found to deliver friction index of 1.2, 1.2 and 1.3 respectively and demonstrated good wet combing and detangling performance.

EXAMPLE COMPOSITION	11	12	13	14	15	16	17	18	19	20
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Ammonium Laureth-3 Sulfate	10.00	10.00	12.50	14.0	10.00	11.00	10.00	10.00	10.00	10.00
Ammonium Lauryl Sulfate	6.00	6.00	1.50		6.00	8.00	6.00	6.00	6.00	6.00
Cocamidopropylbetaine			2.70	2.00						
Cetyl Alcohol			0.90			0.60			0.60	
Cocamide MEA			0.80			0.80			0.80	
Polyquaternium-10 (13)		0.50								
Polyquaternium-10 (14)			0.50	0.20						
Polyquaternium-10 (15)					0.25			0.25		
Polyquaternium-10 (1)							0.50		0.25	0.35
guar hydroxypropyl trimonium chloride (16)						0.50				
Dimethicone (17)							0.25			
Dimethicone (18)								0.20		
PEG 14M (19)							0.30			
Ethylene Glycol Distearate			1.50						1.50	
trihydroxystearin (3)		0.15			0.25		0.30			
Carbomer (20)										1.00
Perfume Solution	0.55	0.55	0.55	0.55	0.55	0.55	0.85	0.55	0.55	0.90
Sodium Citrate	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Citric Acid	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sodium Chloride	0.50	0.50	3.50	0.50	0.50	2.50	0.45	0.50	0.50	0.50
precipitated silica (4)	0.20	0.25				0.50	1.00		0.50	
polymethylsilsequioxane (21)					1.00					2.00
fumed silica (22)			2.00	0.50				0.50		
Expancel 091DE (23)		0.25								1.00
Scotchlite Glass Bubbles (24)			1.00	0.20		1.00		0.50		
polyethylene (25)	1.00				2.00		2.00		1.00	
Water and Minors (QS to 100%)										

(13) Polymer LR400 available from Amerchol with a charge density ~ 0.7 meq/g and molecular weight ~400,000

(14) Polymer JR30M available from Amerchol with a charge density ~ 1.25 meq/g and molecular weight ~2,000,000

(15) cationic cellulose supplied by Amerchol [charge density ~2.4 meq/g, molecular weight ~ 450,000]

(16) cationic guar supplied by Aqualon [charge density ~ 2.1 meq/g, molecular weight ~ 2,400,000]

5 (17) Viscasil 330M available from General Electric

(18) emulsion of 60,000 csk polydimethylsiloxane with particle size of approximately 300nm available as DC1664 from Dow Corning

(19) Polyox WSR N-3000 available from Union Carbide

(20) Carbopol Ultrez 10 available from Noveon, Inc.

10 (21) Tospearl 240 silicone resin particle available from General Electric Silicones [particle size ~4 microns]

(22) Aerosil 200 available from Degussa Corp.

(23) Expancel 091DE available from Akzo Nobel [particle size ~35-55 microns]

(24) Scotchlite Glass Bubbles S60 available from 3M Corp [particle size ~ 30 microns]

15 (25) Micropoly 250S available from Micro Powders, Inc [particle size ~ 3 microns]

It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to one skilled in the art without departing from the scope of the present invention.